

IMPORTANCE OF GEOLOGIC FRAMEWORK FOR UNDERSTANDING CONTAMINANT TRANSPORT AND DESIGNING REMEDIATION IN SEDIMENTARY ROCKS

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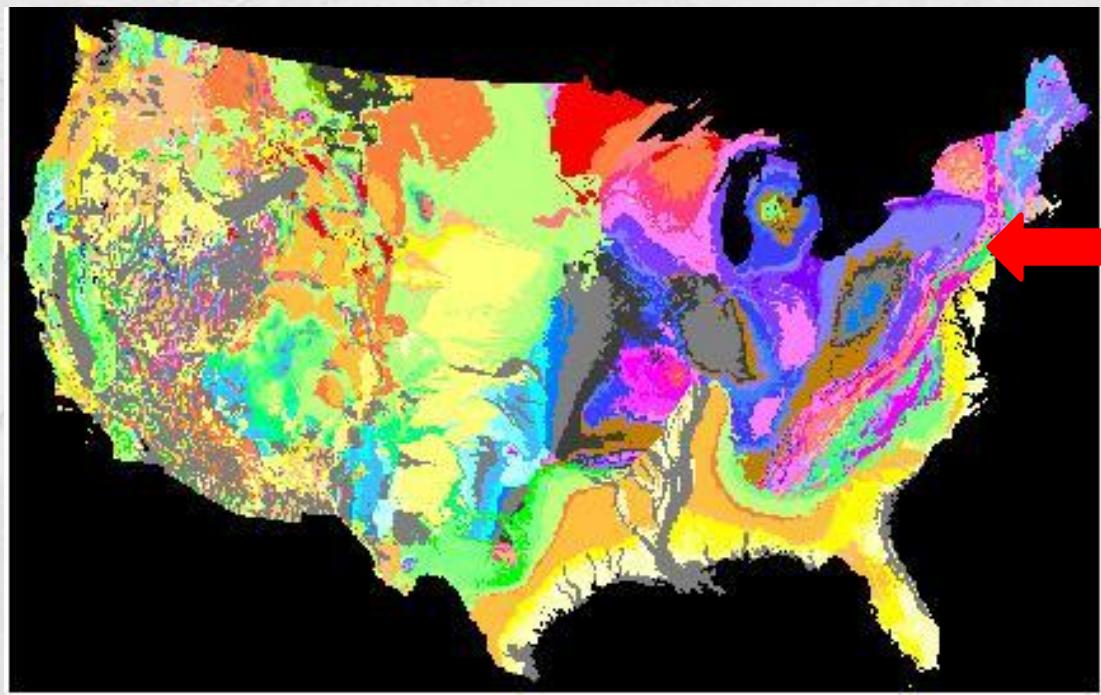
Who Uses the Detailed Geologic Framework

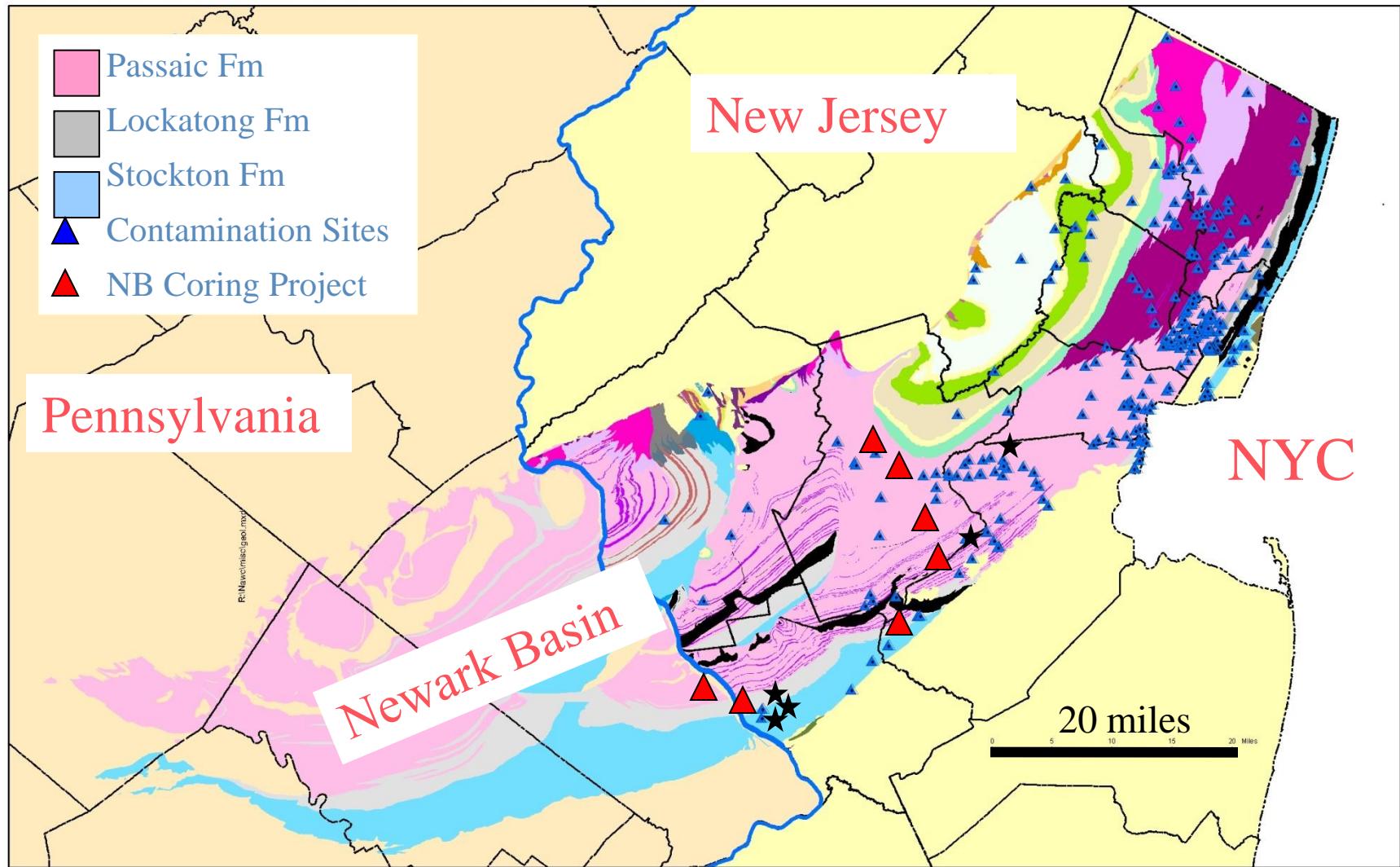
- Hydrologists
- Modelers
- Chemists
- Microbiologists
- Geophysicists

- Regulators
- Managers
- Land owners
- Public

Why did the USGS Toxics Program choose this site for fracture rock research?

- 2/3's of USA is covered with sedimentary rocks
 - 2/3's of all sedimentary rocks are mudstones
 - 1000's of industrial contamination sites in northeast US
 - Site with well defined framework
-
- This site
 - bedrock of mudstone,
 - unglaciated
 - contaminated
 - in the northeast
 - Framework well defined



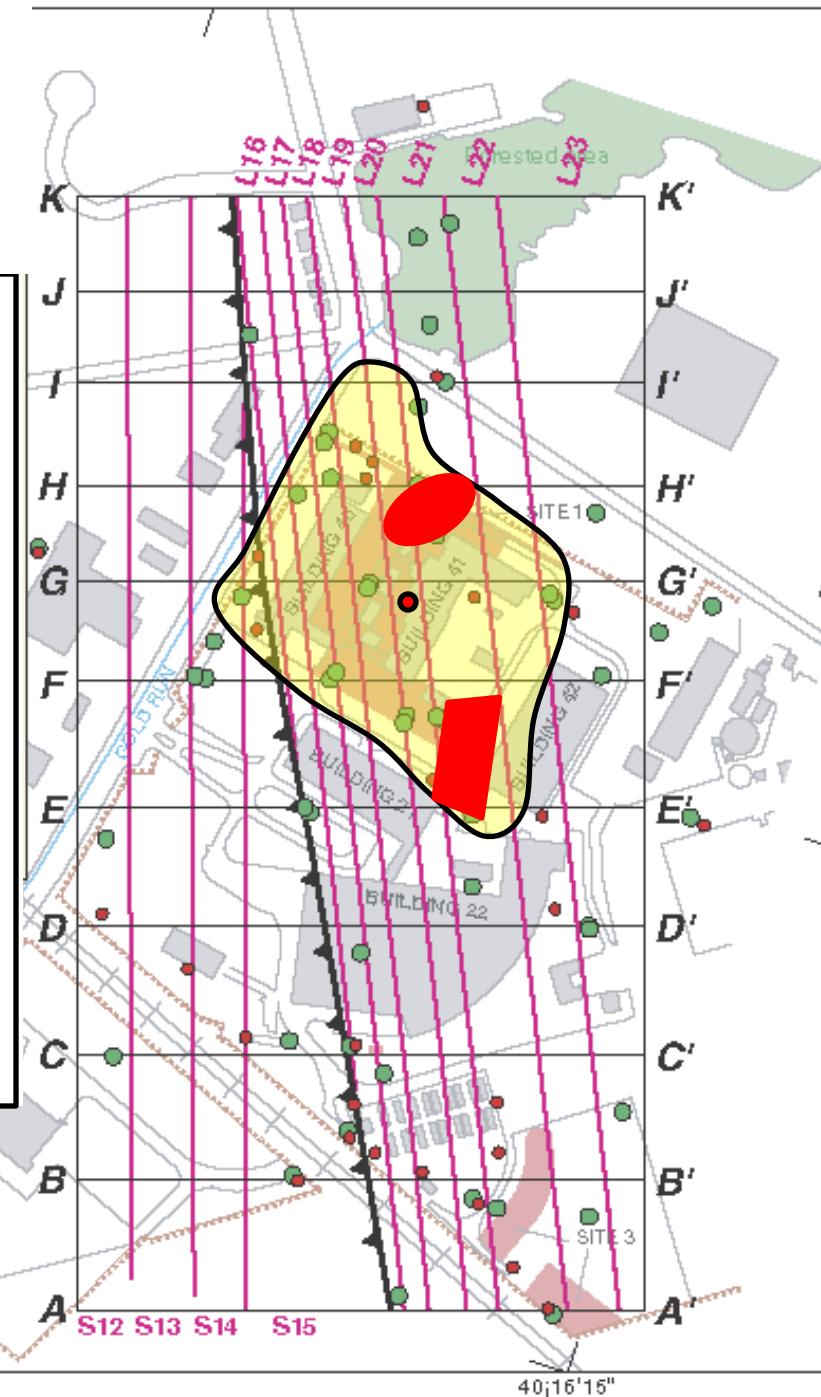
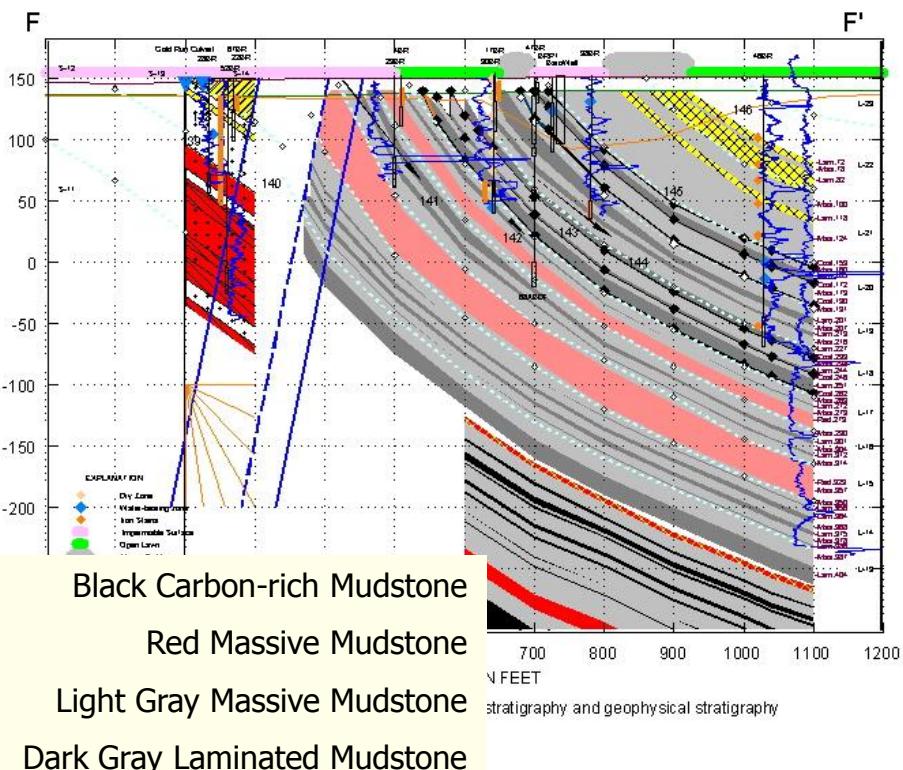


~165 Active US EPA Superfund Sites in NJ

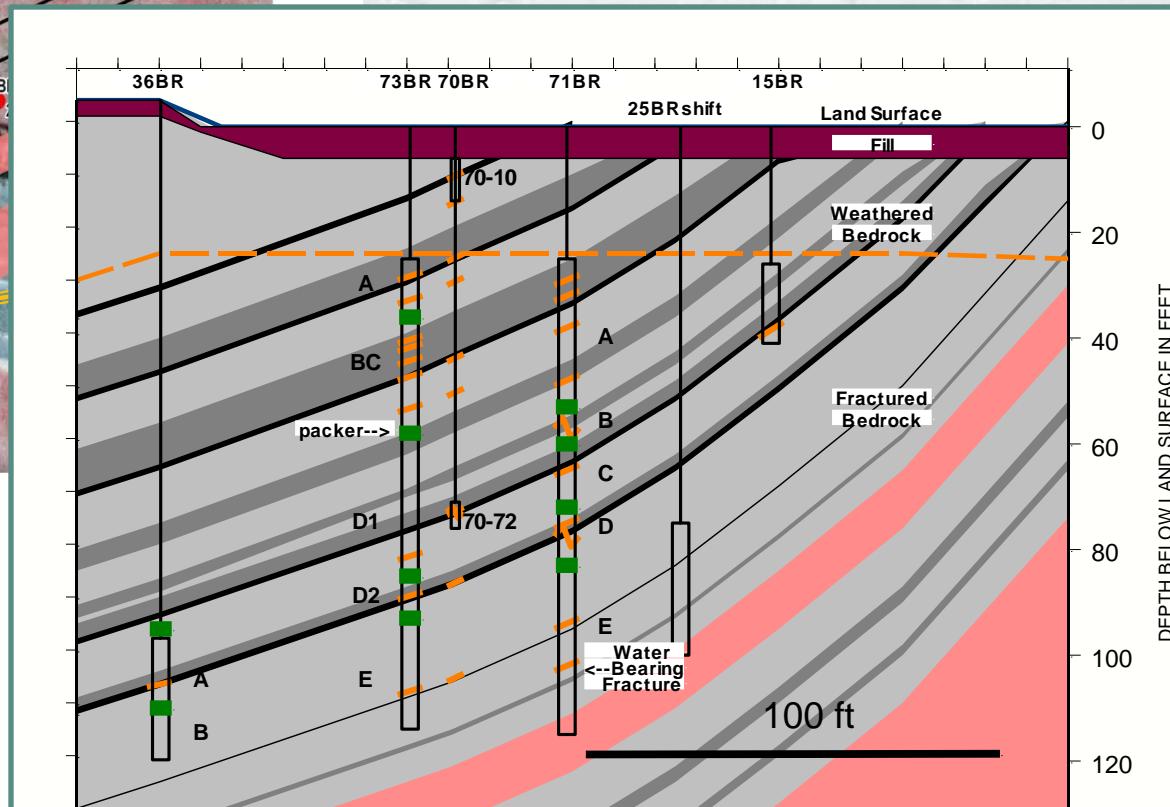
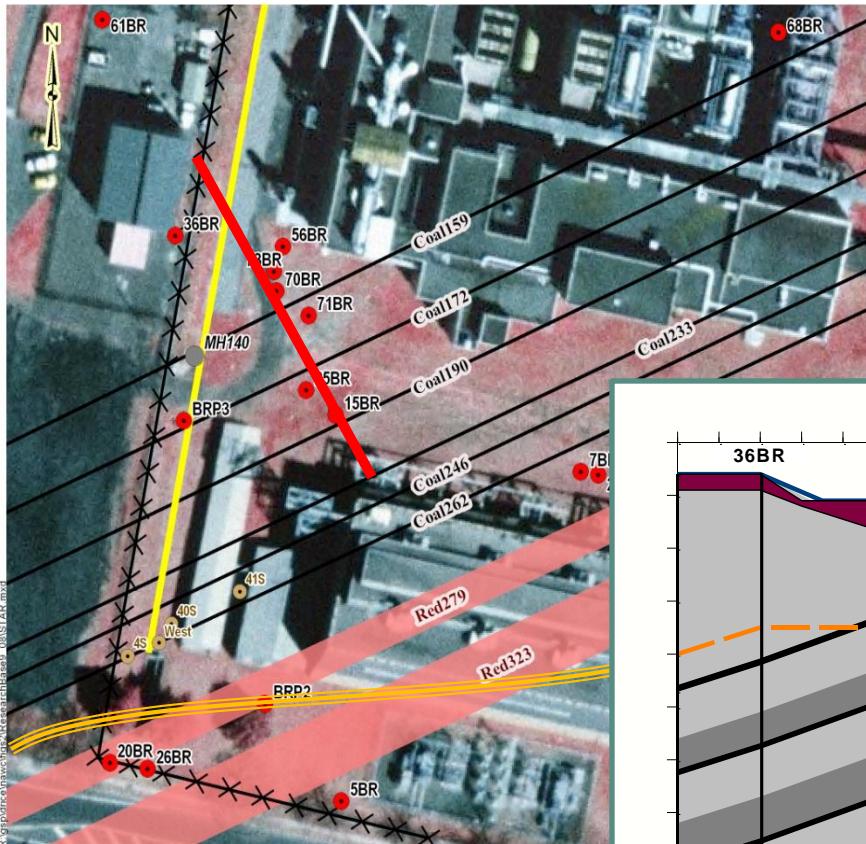
~800 Active NJ DEP Contamination Sites

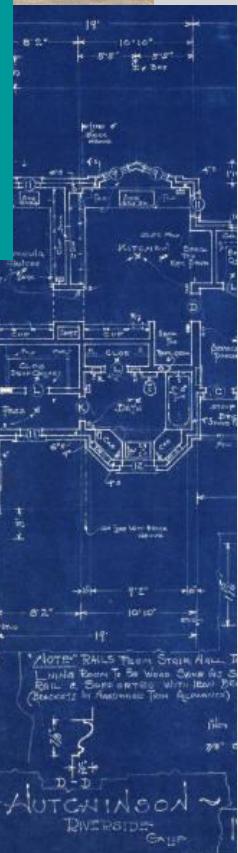
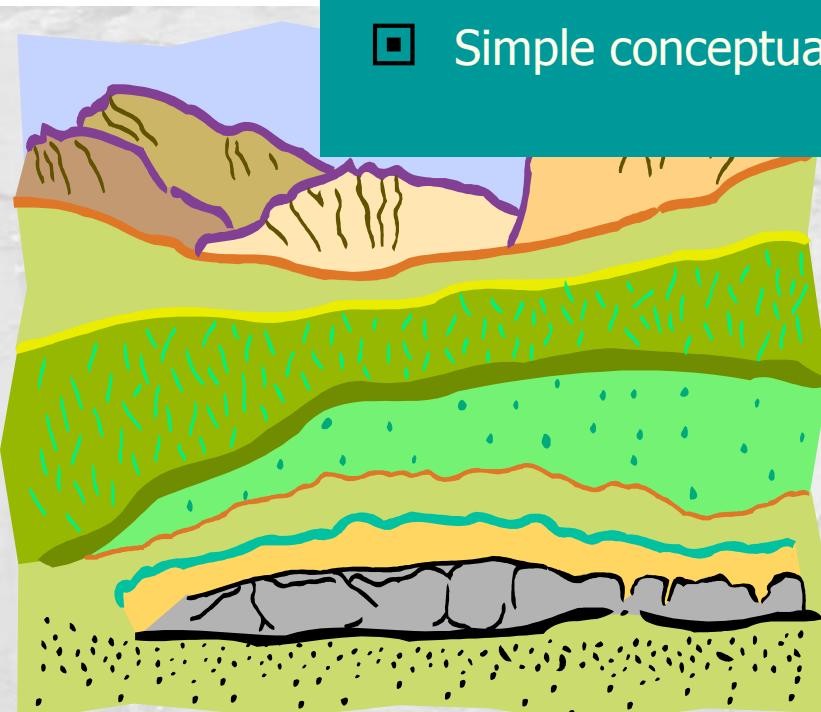
~200 EPA and PA DEP Contamination sites

~25 EPA and NYDEC contamination sites



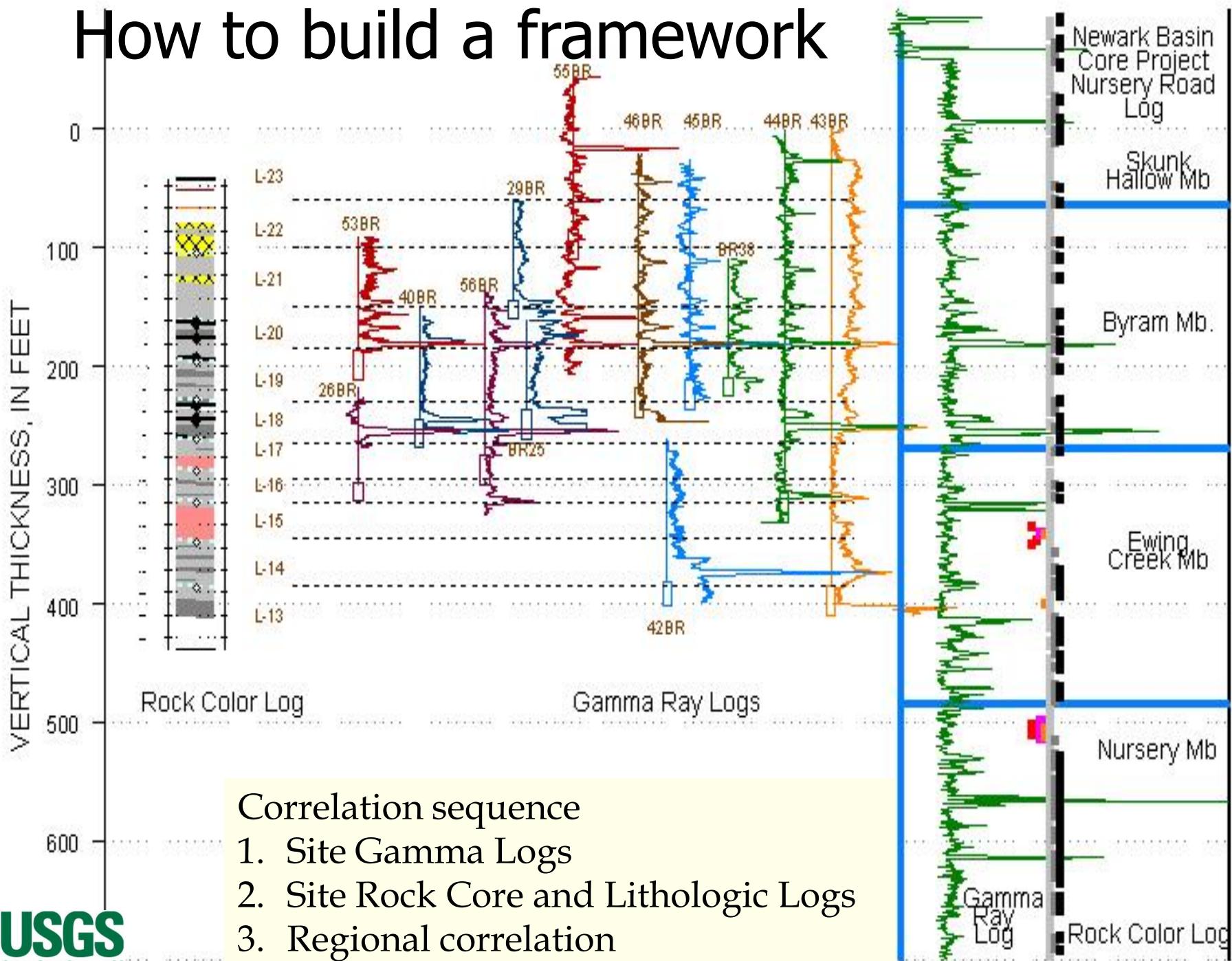
Geology of Toxics Program Research Site



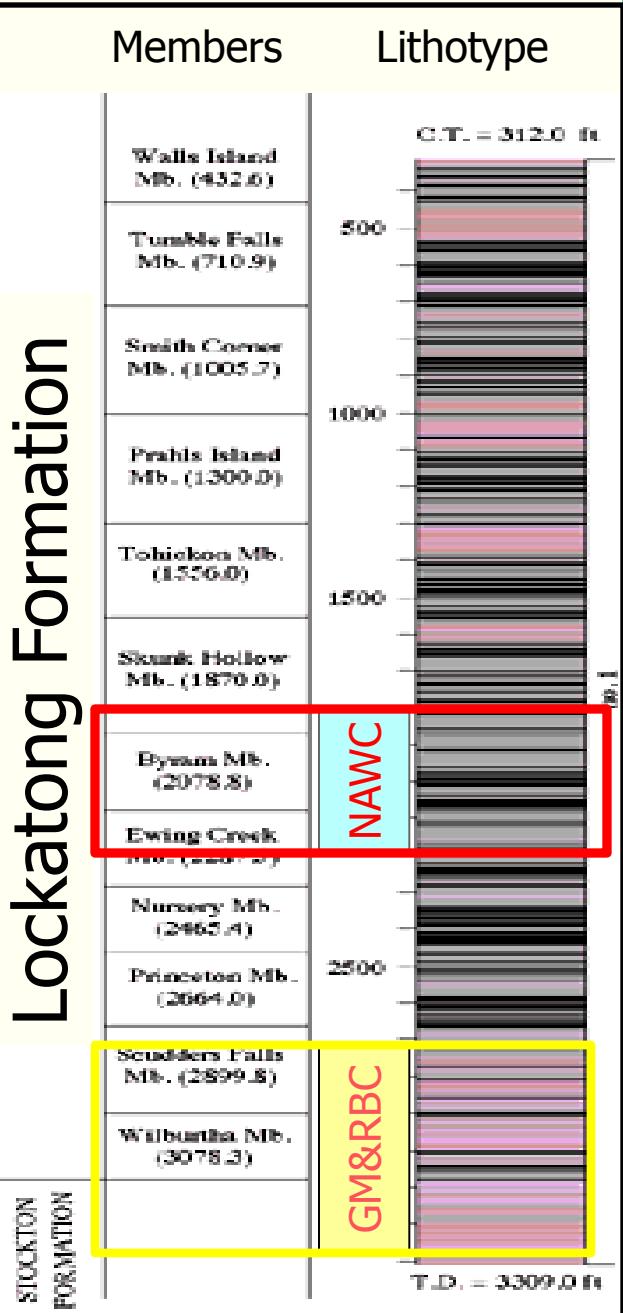


- Planning on spending Time and Money for Research and Remediation
- Many detailed architecture type drawingsneeded
- Simple conceptual diagrams mislead all involved

How to build a framework

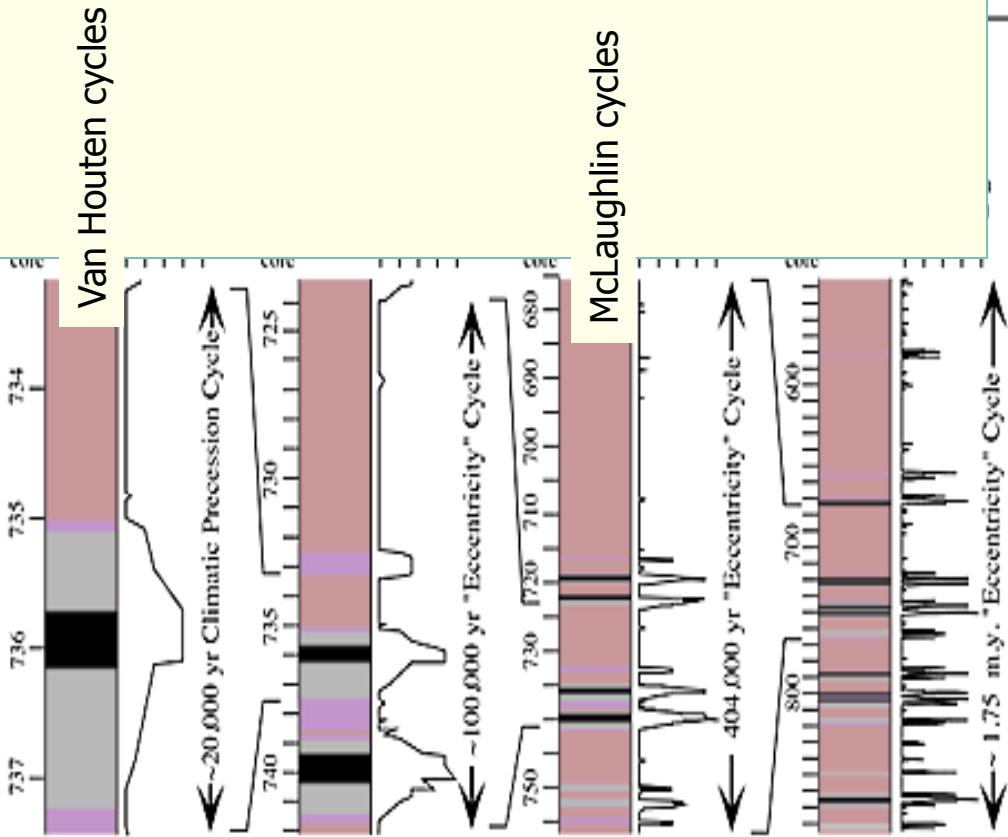


Lockatong Formation



Celestially Controlled Compound cyclic deposits

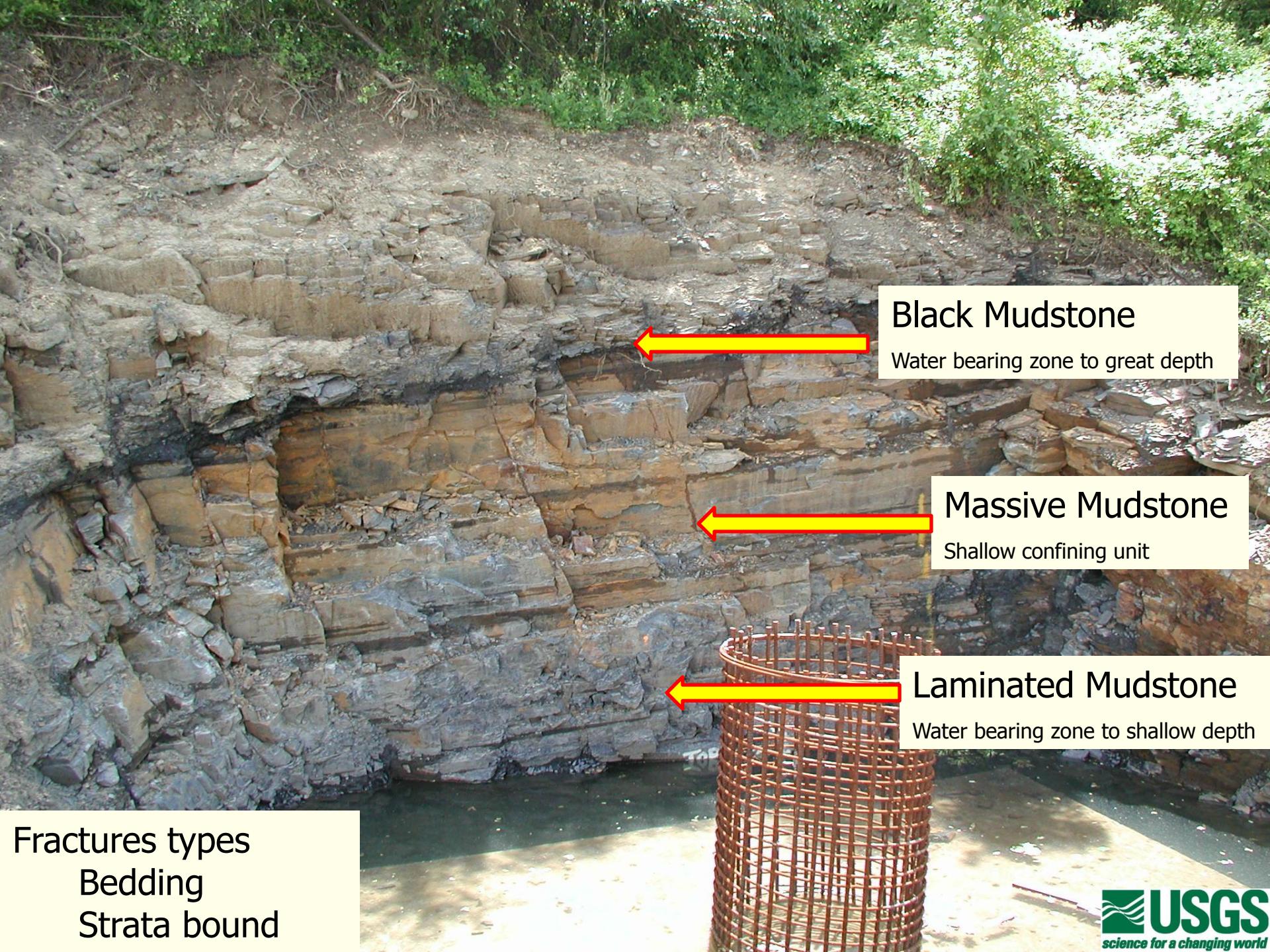
- Van Houten cycles
- Coal sandstone cycles
- Limestone-Marl cycles



Black, Laminated, Brecciated Mudstone at 250 ft BLS

1 foot



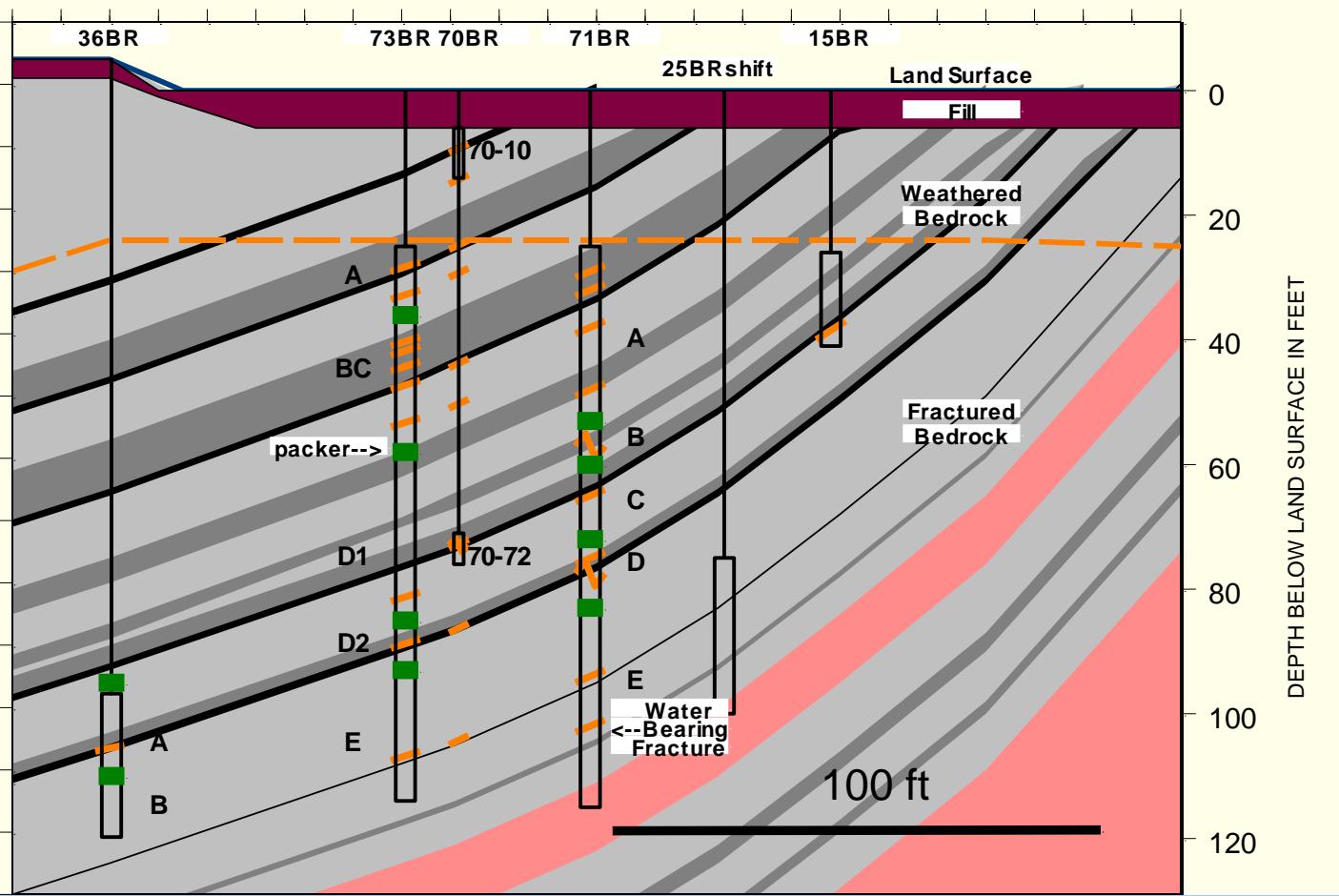




Carbon-rich Mudstone

Laminated Mudstone

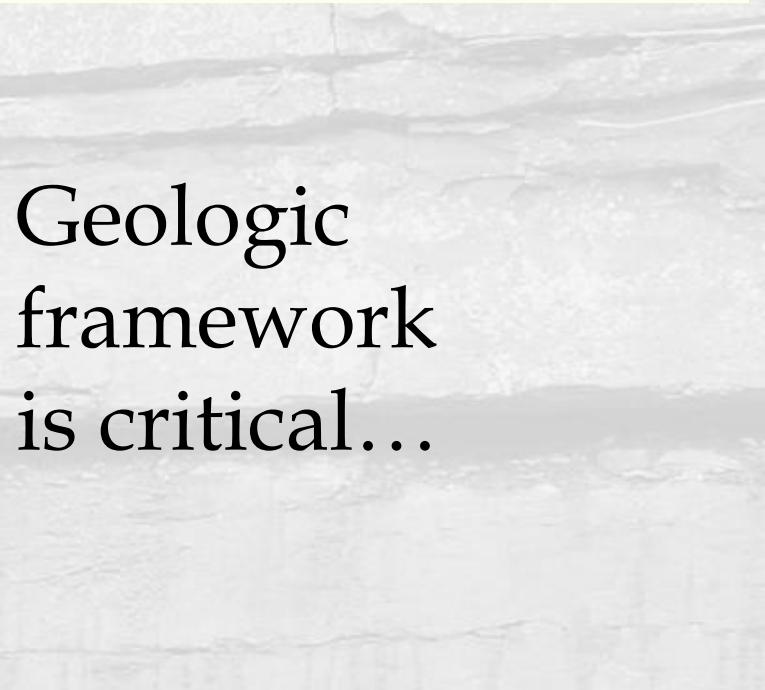
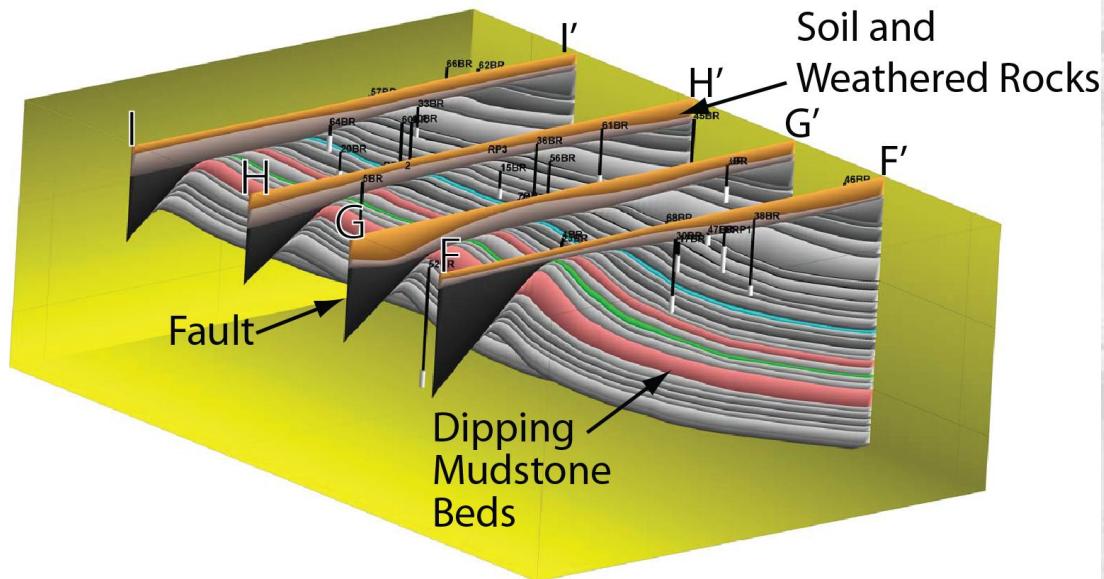
Massive Mudstone



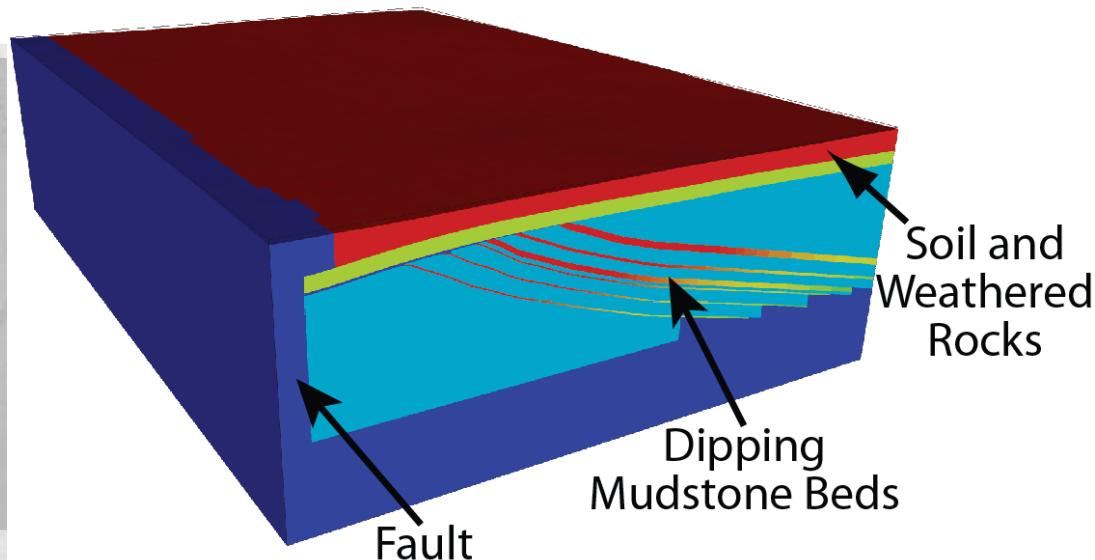
- Rock Based Stratigraphy
 - Lithostratigraphy
 - Weathering Stratigraphy
 - Lithostatic pressure stratigraphy
 - Fracture Stratigraphy

- Chemical and Biological layers
 - DNAPL and LNAPL stratification
 - Chemical stratification
 - Microbiological stratification

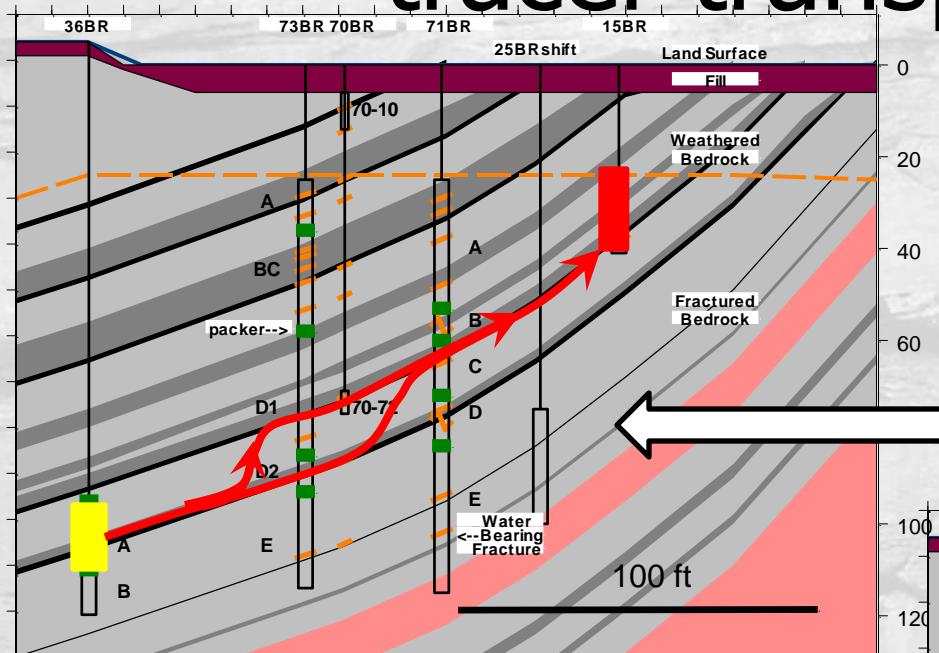
Geology is the foundation for flow models



...to building a realistic ground-water model that simulates fluxes important to transport and remediation



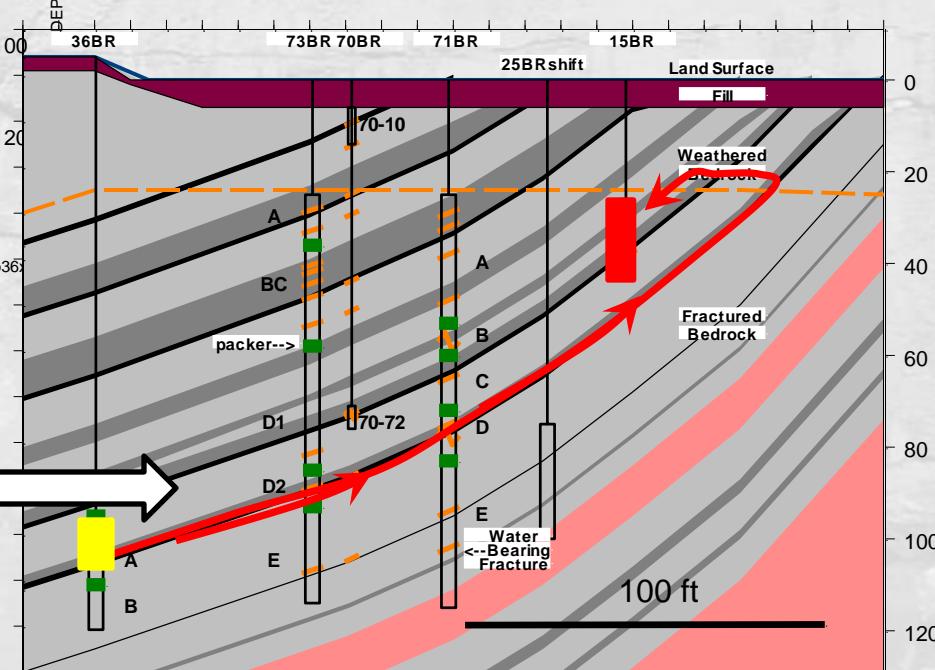
Geologic framework identifies likely tracer transport paths



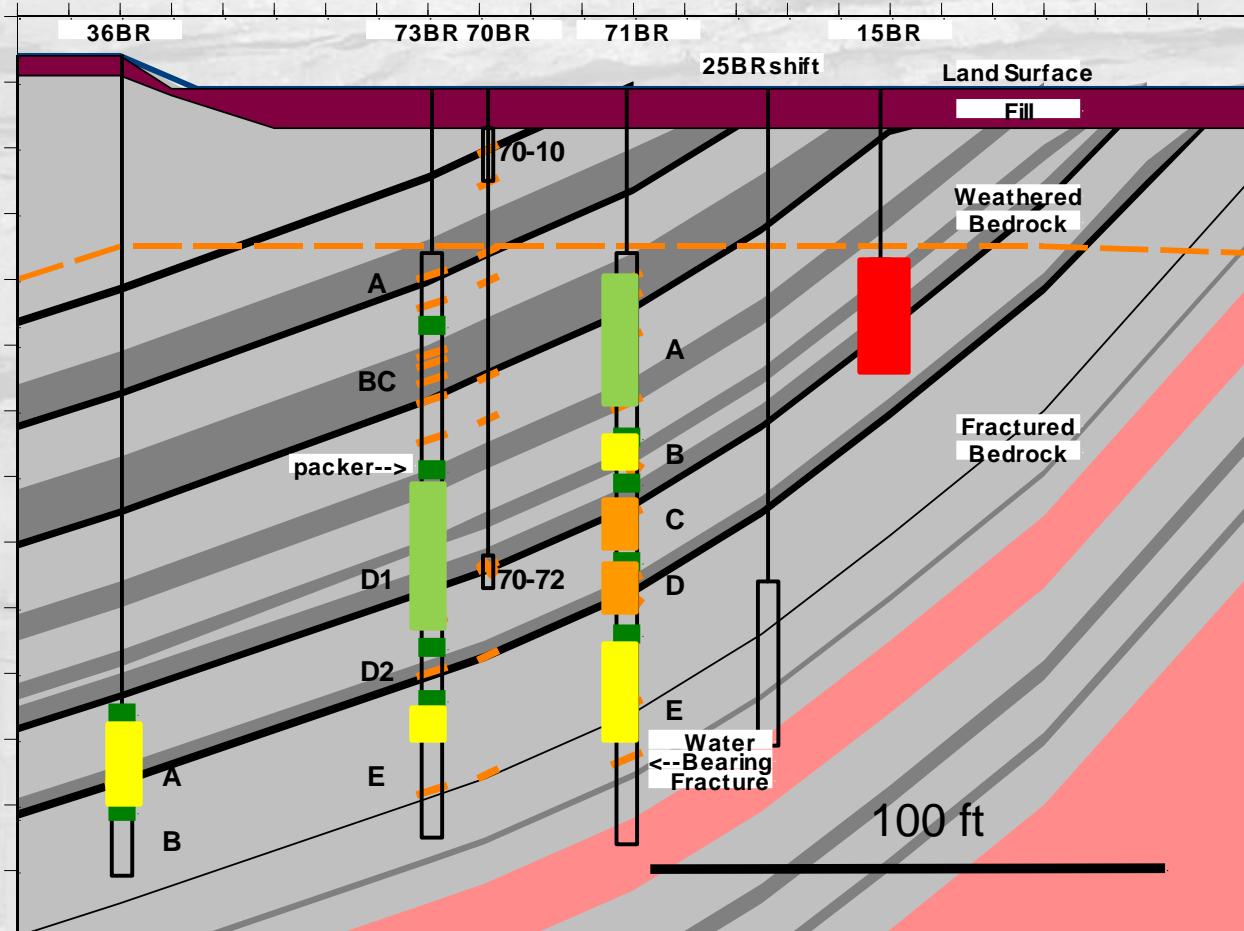
Tracer travel path is up-dip within Fissile, black, carbon-rich, mudstone

Tracer may cross cut low K zones
Fissile, black, carbon-rich, mudstone

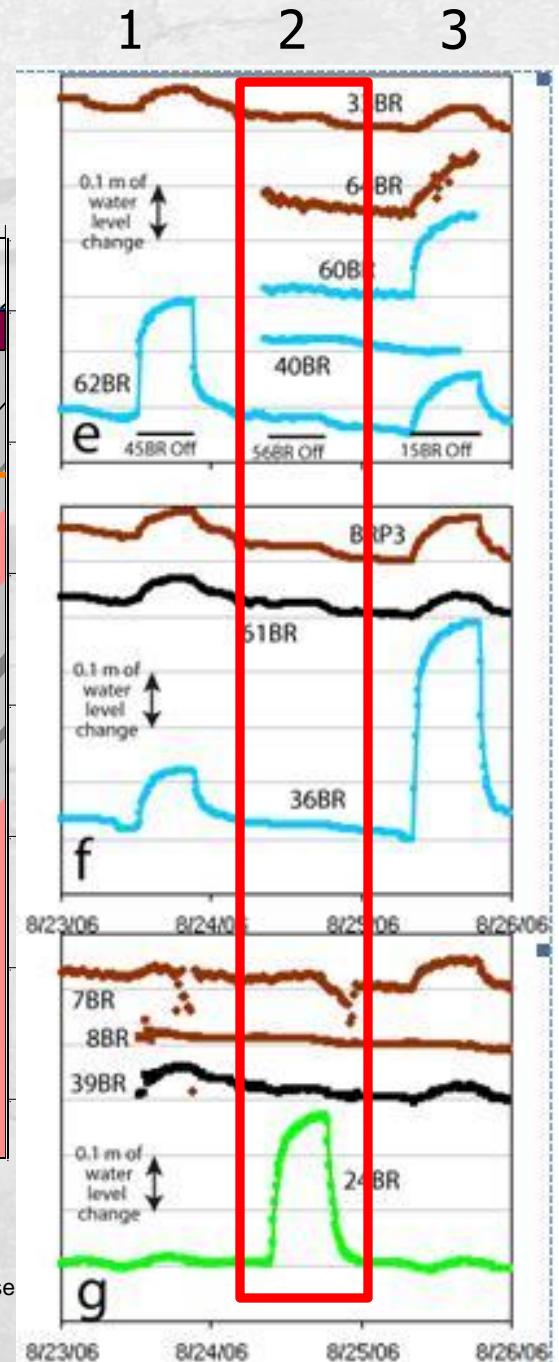
Tracer may flow to weathered zone
and then downdip in overlying
Fissile, black, carbon-rich, mudstone



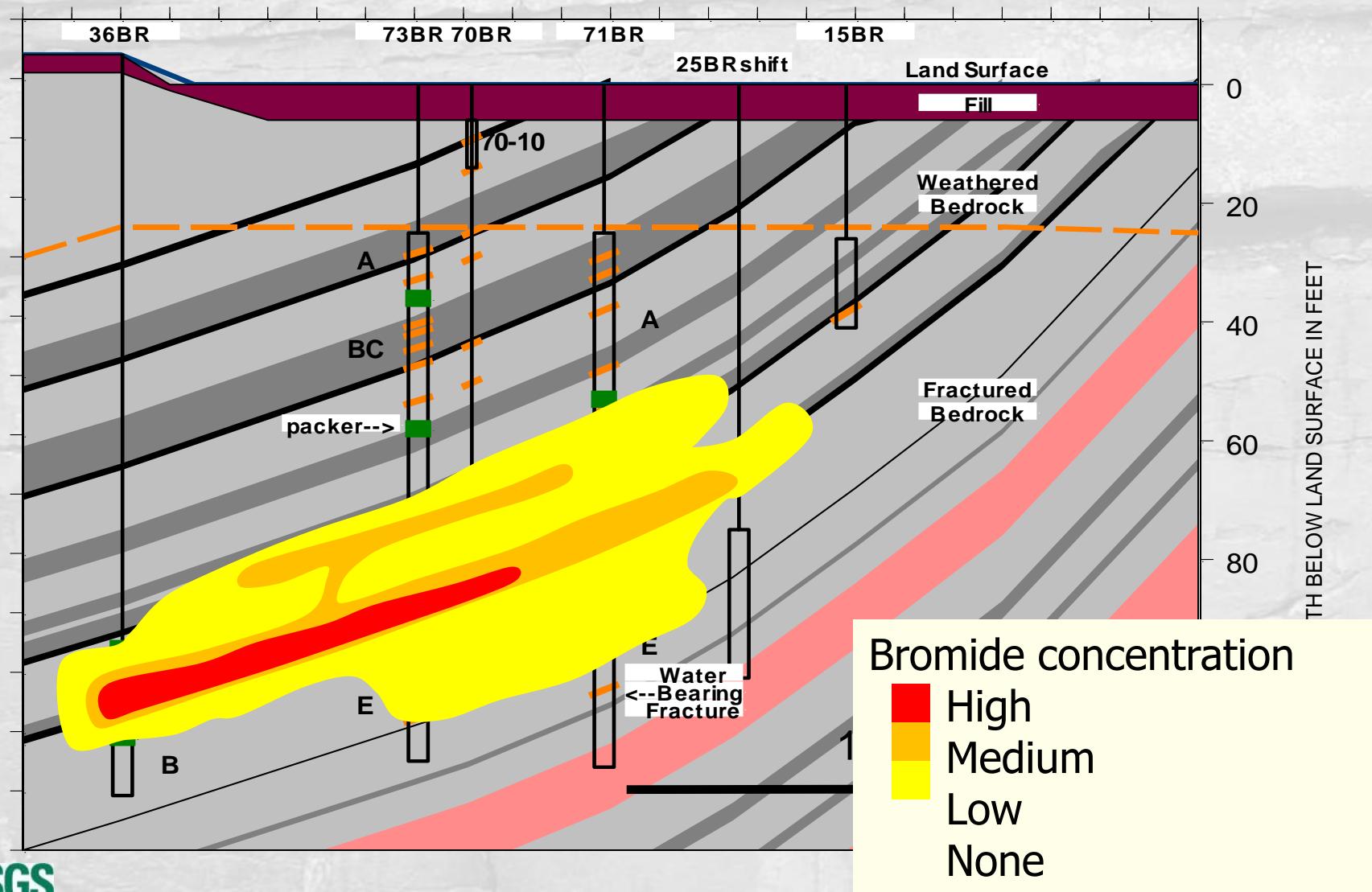
Geologic framework is key to interpretation of aquifer tests



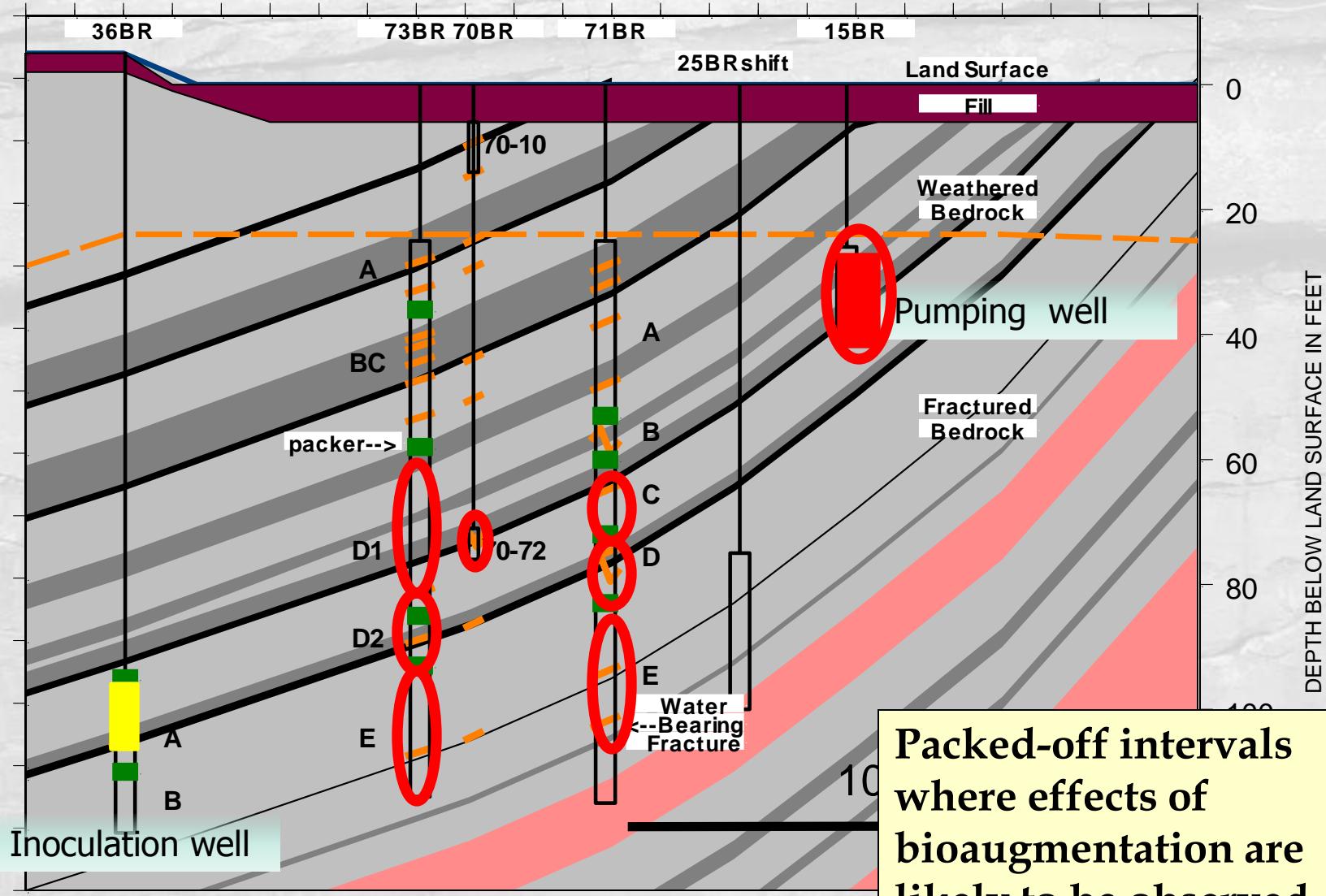
Toxics/Sections/Drilling2007/se



Geologic framework essential for interpreting tracer test results



Geology & tracer testing guide selection of critical bioaugmentation monitoring locations



Summary

- ❑ Framework development is successfully used
 - Newark Basin contamination sites.
 - Piedmont Schist contamination site
- ❑ Envision it will work in most cyclically deposited rocks
- ❑ Framework helps Scientist and Non scientist in their understanding of the site

- ❑ Spend appropriate time and money on framework and subsequent tasks will be made easier and cost less for all involved

Acknowledgements

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- SERDP

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- GM with Haley & Aldrich Inc
- Rare Earth EnvironScience Inc with General Sullivan Group
- Foster Wheeler Inc

